

# A Modular Minimum Cost Launch System for Nano-Satellites, Phase II

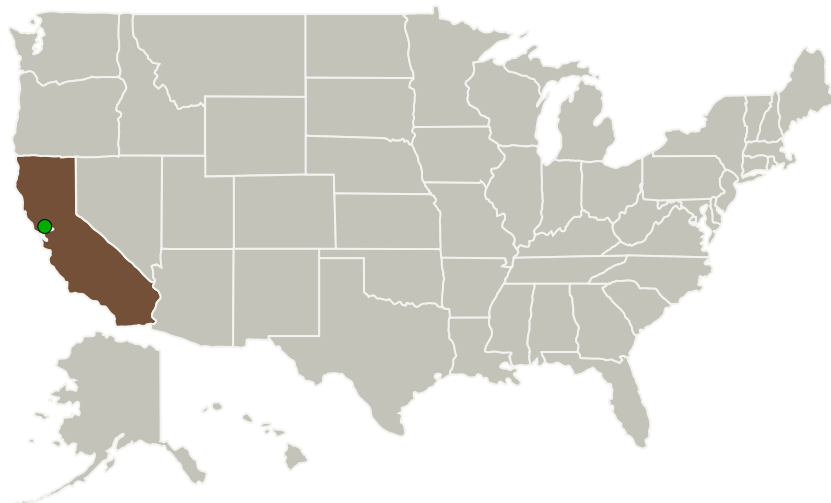
Completed Technology Project (2010 - 2013)



## Project Introduction

As minimum cost will be required for a dedicated Nano-Sat Launch Vehicle, a parallel staged, highly modular vehicle architecture is proposed for development. The principal advantage of a modular architecture for this size of vehicle is the single propulsion development for the boost stages at a relatively small scale. This approach drastically shortens development timelines and cost. A candidate launch vehicle with a cluster of seven identical modules would light 4 modules for the first stage, 2 for the second, 1 for the third, and fire 1 small spinning Apogee Kick Motor (AKM) for the fourth. Whittinghill Aerospace (WASP) proposes to refine the Phase 1 design of an all-composite, N<sub>2</sub>O-fed Hybrid Rocket Motor (HRM) propelled, 25 kg to LEO launcher. WASP will then build and fire the AKM, build and fire the core module HRM, then launch the full-scale core module as an unguided sounding rocket from a commercial range. At the conclusion of Phase 2, the technology will be at a TRL level of 6.

## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Whittinghill Aerospace, LLC	Lead Organization	Industry	Camarillo, California
● Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California



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## Primary U.S. Work Locations

California

## Project Transitions



**February 2010:** Project Start



**March 2013:** Closed out

### Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138737>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

Whittinghill Aerospace, LLC

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

Carlos Torrez

### Principal Investigator:

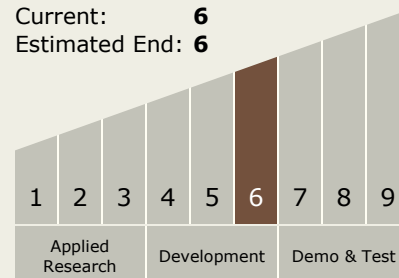
George R Whittinghill

## Technology Maturity (TRL)

Start: 6

Current: 6

Estimated End: 6



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## Technology Areas

### Primary:

- TX01 Propulsion Systems
  - └ TX01.1 Chemical Space Propulsion
  - └ TX01.1.5 Hybrids

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System